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Remarks/Arguments

Examiner Ms. Joannie Garcia is thanked for the thorough Office Action.

Election/Restriction

Applicant acknowledges the final of the requirement of with respect to the applicant's traverse of the invention claims.

Non-elected claim 28 to 35 are canceled. These claims will be prosecuted in a division patent application at a later date.

In the Specification

The specification has been amended as kindly suggested by the examiner in the office action page 2. The specification has been reviewed and amendments made to correct typographical and editorial errors. No new matter has been added.

In the Claims

The claims 1 to 27 are amended to overcome the objections in the office action. The claims have been reviewed and amendments made to correct typographical errors.

Claim 8 is amended to correct a typographical error. For support see spec. 17, L15 to 17.

New dependent claims 36 and 37 are added. For support see claims

New parent claim 38 is added. Parent claim 38 has similar limitation as parent claim 1 plus the additional limitation of "performing a doped depletion region implantation by, using said gate structure as an implant mask and implanting ...". For support see figures 1C and 2B.

New dependent claim 39 is added. For support see amended claim 2.

New dependent claim 40 is added. For support see amended claim 8.

No new matter is added.

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Objections to the Claims

The objections to the claims are acknowledged. The claims have been amended as kindly suggested by the examiner.

Claim 1, line 4, step b is not amended as suggested in the office action. Amended Claim 1, step b states “performing a doped depletion region **implantation** by ...”. The words “doped depletion region implantation” refer to an implant process that comprises “by implanting ions being the a second conductive type ~~to~~ into the substrate to form doped depletion regions;”

Amended Claim 7 (“a region ...”) is supported on See Spec. p. 19, L 3-7.

No new matter is added.

CLAIM REJECTIONS:**Rejection Of Claims 1, 2, 7, 8 and 14 Under 35 U.S.C. § 102(B) as being anticipated by Burr (US 2003/017 869 8 A1)**

The rejection of claims 1, 2, 7, 8 and 14 under 35 U.S.C. § 102(B) as being anticipated by Burr (US 2003/017 869 8 A1) is acknowledged. Reconsideration and withdraw is respectfully requested in view of the comments below.

Reference US 2003-078689 Burr et al.

US 2003-078689 Burr et al. —shows a structure having a resistive path that allows the bulk material potential to track the gate potential, thereby lowering the threshold Voltage as the device turns on. See Abstract. Burr embodiment in figure 7A forms a perforate Buried N+ well 770 under both the NFET and PFET devices.

Amended Claim 1 is not anticipated nor obvious in view of Burr because Burr does not suggest claim 1's limitations of :

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- (1) "said doped depletion regions are depleted"
 (2) the doped depletion regions are beneath said source and drain regions; and

Applicant's Claim 1 is not anticipated nor obvious in view of Burr because Burr does not suggest claim 1's limitations.

Claim 1 states:

1. (CURRENTLY AMENDED) A method of forming a semiconductor device comprising:
- a) forming a gate structure over a substrate being doped with a first conductivity type impurity;
 - b) performing a doped depletion region implantation by implanting ions being ~~the~~ a second conductive type ~~to into~~ the substrate to form doped depletion regions; ~~beneath and separated from said source/drain regions;~~
 - c) performing a S/D ~~implantation implant~~ by implanting ions having a ~~the~~ second conductivity type into the substrate to form ~~S/D~~ source and drain regions adjacent to said gate structure; the doped depletion regions are beneath and separated from said source and drain regions;
 - (1) said doped depletion regions ~~have~~ having an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate.

(1) Burr does not anticipated Claim 1 limitation --"said doped depletion regions are depleted"

Claim 1 step c1 has the limitation :

said doped depletion regions ~~have~~ having an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate.

This limitation is not shown or suggested by the references.

The instant office action, page 6, posits that Burr figure 7A perforated buried n+ well 770 shows this claim 1, step C1 limitation (of the doped depleting regions are depleted).

However, Burr figure 7A teaches away from claim 1, step c1 by showing the perforated buried

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n+ well 770 having a n+ concentration which is not "depleted" since it has an excess of carriers hence the n+ designation on Burr figure 7A.

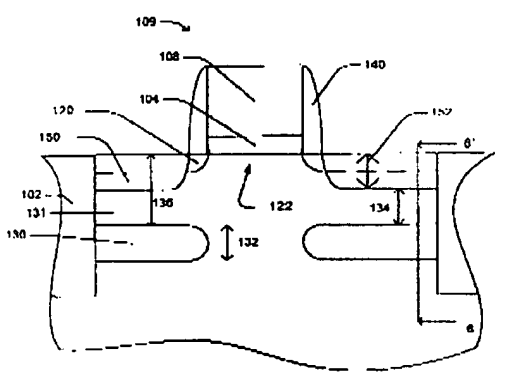
Further support of that Burr's perforated buried n+ well 770 are not depleted is shown in the Burr para 0161; "Device 700A also includes heavily doped perforated buried N-well 770 formed between lightly doped P-layer 706A and heavily doped P-substrate 706B".

Therefore Burr's heavily doped perforated buried n well 770 is not depleted and does not meet or suggest applicant's claim 1 limitation.

(1) Burr does not anticipated Claim 1 limitation - the doped depletion regions are beneath said source and drain regions;

Table A below shows Applicant's figure 3A and US 2003-078689 Burr et al. figure 7A,

Table A

Applicant's figure 3A	US 2003-078689 Burr et al. -figure 7A
<p>4/12</p>  <p>FIGURE 3A</p>	<p>Handwritten notes: S/D, Not over // V_{FW}, S/D</p>

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Claim 1, step c has the limitation that " the doped depletion regions are beneath and separated from said source and drain regions;" For example, figure 3A shows doped depletion regions 130 are beneath the source and drain regions 150. In contrast, Burr figure 7A shows that the perforated Burried N-well (N+) 770 is **not** beneath the both the source and drain regions 703 and 705. Figure 7A clearly shows there is no perforated Burried N-well (N+) 770 beneath the source/drain region 703. In fact, in Figure 7A, Burr teaches away from this limitation by showing only the substrate (not buried N+ well 77) beneath the source/drain 703. See Figure 7A; See Burr para 164. A Key to Burr's invention is the opening below the S/D that provide a longer resistance path. See Burr Abstract, col. para 164.

Furthermore there is no motivation to modify Burr to meet applicant's claim 1 since Burr solves a different problem than the invention.

Other claimed differences between claim 1 and Burr

Burr figure 7A shows a buried n+well 770 that is under the PFET 702. In Burr, the S/D regions 710 708 are doped with the opposite conductivity type dopants (e.g, P and N). This is the opposite of claim 1's limitation that the S/D regions and the doped depletion regions be of the same conductivity type.

Claim 2 is not anticipated by Burr

Claim 2 states:

2. (CURRENTLY AMENDED) The method of claim 1 wherein said doped depletion region regions are not formed under said gate structure.

In contrast to claim 2, Burr figure 7A shows the N+ well 770 under the gated 704. Therefore claim 2 is not anticipated by Burr. **No Figure or Text in Burr suggest Claim 1 and 2's structure shown in applicant's figure 3A where the doped depletion region 130 is under the S/D regions 150 152 and not under the gate 108.** Therefore claim 2 is non-obvious.

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Claim 7 is not anticipated by Burr

Claim 7 states:

7. (CURRENTLY AMENDED) The method of claim 1 wherein ~~the~~ a region of said substrate between said source/drain regions and said doped depletion regions has a concentration of a the first conductivity type impurity between 1E16 to 1E18 atom/cc; a channel region in said substrate under said gate structure; said channel region has a concentration of a second type impurity between 1E16 to 1E18 atom/cc.

Claim 7 depends from allowable parent claim 1 and is therefore allowable.

Claim 8 is not anticipated by Burr

Claim 8 states:

8. (ORIGINAL) The method of claim 1 wherein said depletion regions are fully depleted.

As explained and supported above, Burr's heavily doped N⁺ buried wells are not depleted and therefore are not "fully depleted".

Claim 14 is not anticipated by Burr

Claim 8 states:

14. (CURRENTLY AMENDED) The method of claim 1 wherein said ~~first conductive type~~ substrate is comprised of Si or SiGe or strained Si, or relaxed SiGe or strained Ge.

Applicant could not find where Burr suggested this limitation.

Rejection of claims 12, 13, 15, 18-21 and 23-25 under 35 U.S.C. § 103(a) as being unpatentable over Burr as applied to claims 1, 2, 7, 8 and 14 above and further in view of Bae et al. al (20040075143 A1).

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The rejection of claims 12, 13, 15, 18-21 and 23-25 under 35 U.S.C. § 103(a) as being unpatentable over Burr as applied to claims 1, 2, 7, 8 and 14 above and further in view of Bae et al. (20040075143 A1) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested in view of the amendments.

The combination of Burr and Bae is improper

The combination of Burr and Bae is improper for the following reasons. Burr and Bae are unrelated, solve different problems, use different solutions and have no process steps in common. The combination is Unsuggested: The prior art references do not contain any suggestions (express or implied) that they be combined, or that they be combined in the manner suggested. The references are individually Complete: Each reference is complete and functional in itself, so there would be no reason to use parts from or add or substitute parts to any reference. Therefore combination is improper.

Even if combined, the references do not meet or suggest the applicant's claims.

The dependent claims depend from non-obvious parent claims and are therefore non-obvious. As described above, the parent claims are non-obvious over the references. Furthermore, the parameters given provide further limitations that provide for the parent claims's novel doped depletion region and depletion region. The parameters differentiate over the parameter given in the reference. There is no motivation to modify the references because the reference do not suggest applicant's claimed doped depletion region and depletion regions.

Claims 28 to 35 are CANCELED

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New claims 36 and 37 are non-obvious.

New claims 36 and 37 are non-obvious. New claims 36 and 37 state non-obvious limitations not shown or suggested by the prior art.

Claims 36 and 37 state:

36.(NEW) The method of claim 1 which further includes said gate structure has sidewalls; forming one or more spacers on the sidewalls of said gate structure.

37. (NEW) The method of claim 1 which further includes said gate structure has sidewalls; forming two or more spacers on the sidewalls of said gate structure prior to the doped depletion region implantation.

New Parent claim 38 is non-obvious

New parent claim 38 states:

38. (New) A method of forming a semiconductor device comprising:
forming a gate structure over a substrate being doped with a first conductivity type impurity;
performing a doped depletion region implantation by, **using said gate structure as an implant mask** and implanting ions being a second conductive type into the substrate to form doped depletion regions;
performing a S/D implantation by implanting ions of the second conductivity type into the substrate to form source and drain regions adjacent to said gate;
the doped depletion regions are beneath and separated from said source and drain regions; said doped depletion regions have an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate.

New parent claim 38 has at least the novelty of the limitation (Bold added):

“performing a doped depletion region implantation by, **using said gate structure as an implant**

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mask and implanting ions being a second conductive type into the substrate to form doped depletion regions;"

New dependent claims 39 and 40 are non-obvious.

New dependent claim 39 is added. Claim 39 is non-obvious for the reasons given above for amended claim 2.

New dependent claim 40 is added. Claim 40 is non-obvious for the reasons given above for amended claim 8.

ALLOWABLE SUBJECT MATTER

The objection to claims 3-6, 9-11, 16, 17, 22, 26, and 27 as being dependent upon a rejected base claims, but allowable if rewritten in independent form is acknowledged. Applicant requests that the rewriting of allowable claims 3-6, 9-11, 16, 17, 22, 26, and 27 be held in abeyance pending the final determination of the allowability of the amended parent claims and other dependent claims.

CONCLUSION

It is believed that all the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of the unpatentability of the claim prior to its amendment.

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In conclusion, reconsideration and withdrawal of the rejections are respectfully requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone the undersigned attorney at (215) 670-2455 should there be anyway that we could help to place this Application in condition for Allowance.

Charge to Deposit Account

The Commissioner is hereby authorized to apply any fees or credits in this case, which are not already covered by check or credit card, to Deposit Account No. 502018 referencing this attorney docket. The Commissioner is also authorized to charge any additional fee under 37 CFR §1.16 and 1.17 to this Deposit Account.

Respectfully submitted,

Date: 4/15/05

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